REMARKS

Entry of this Reply under 37 C.F.R. §1.116 is respectfully requested because it places the application in allowance or in better form for appeal. The amendments to the claims raise no new issues, because the claim amendments restore cancelled subject matter that has been considered by the Examiner.

No new matter is believed to be added to the application by this Reply.

Status of the Claims

Claims 1-11, 14 and 15 remain pending in the application. Upon entry, Claims 1 and 2 are amended to restore subject matter cancelled in the amendment filed January 21, 2003. Claims 12 and 13 are withdrawn.

Rejections Under 35 U.S.C. §103(a) Based On Mishima

Claims 1 and 6-11 are rejected under 35 U.S.C. §103(a) as being obvious over Mishima (U.S. Patent 5,633,516) in view of Udagawa (U.S. Patent 6,462, 361 and Kizuki (U.S. Patent 5,948,161). Claims 2 and 5 are rejected under 35 U.S.C. §103(a) as being obvious over Mishima in view of Udagawa and Inoue (U.S. Patent 5,134,446). Applicants traverse.

The Present Invention and its Advantages

The present invention pertains to a 3-5 group compound semiconductor that includes a GaAs substrate, a buffer layer over the GaAs substrate and an epitaxial crystal layer over the buffer layer. The invention utilizes an $In_xGa_yAl_zAs$ epitaxial structure that does not contain P (phosphorous). The buffer layer suppresses the dislocation density in the epitaxial layer, as is discussed in the specification at page 3, lines 12-14.

The invention is typically embodied by claim 1, which sets forth:

> 1. A 3-5 group compound semiconductor comprising a GaAs substrate, a buffer layer on said GaAs substrate and an epitaxial crystal layer on said buffer layer, said layers being formed by an epitaxial crystal growth method, wherein
>
> said buffer layer and said epitaxial crystal layer on said buffer layer are 3-5 group compound semiconductors each independently represented by the general formula $In_xGa_yAl_zAs$ (wherein, $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$, $x+y+z=1$), and said buffer layer has a structure formed by laminating at least two kinds of layers having different compositions for n ($1 \leq n \leq 30$) times, where n is the number of repetitions of the two kinds of layers, and the two kinds of layers are a $Ga_{1-Z}Al_ZAs$ layer (wherein $0 < Z \leq 1$) and a GaAs layer, and the dislocation density in the epitaxial crystal layer on said buffer layer is $2000/cm^2$ or less.

Also, independent claim 2 sets forth that the dislocation density in the epitaxial crystal layer on the buffer layer is 1/3 or less of the dislocation density in the GaAs substrate.

Further, independent claims 1 and 2 have been amended to stand as originally presented plus additionally incorporating the subject matter of cancelled claims 3 and 4, as was agreed to in the Interview of January 15, 2003.

Distinctions of the Invention over Mishima and the Secondary References

Mishima pertains to a lattice-mismatched crystal structure that includes a semiconductor film formed on a substrate with an intervening buffer layer. Figure 1 of Mishima shows a GaAs substrate 1 over which is found a buffer layer 2, an undoped InGaAs channel forming layer 3, an InAlAs spacer layer 4, a carrier supply layer 5, an undoped InAlAs layer 6 and a cap layer 7.

Mishima fails to disclose or suggest a buffer layer having multiple layers that are not formed by varying indium content. Mishima also fails to disclose that the buffer layer has a structure of n times ($1 \leq n \leq 30$) of $Ga_{1-z}Al_zAs$ layer (wherein $0 < z \leq 1$). The Examiner admits this latter failing at *inter alia* page 2, lines 20-21 of the Office Action mailed June 18, 2003.

In the Office Action, the Examiner asserts: "Fig. 1 of Udagawa teaches a superlattice structured buffer layer (11) of AlGaAs/GaAs on a GaAs substrate (10)." Office Action at page 2, lines 21-23. Udagawa, however, relates to a GaInP epitaxial stacking structure that has a homogeneous indium composition. Udagawa at column 4, lines 31-36 states: "Therefore, a third object of the present invention is to provide an epitaxial stacking structure comprising a buffer layer for forming a $Ga_YIn_{1-Y}P$ ($0 < Y \leq 1$) electron-supply layer that has high resistance suitable for reducing the leakage current and that has a homogeneous indium composition."

Amended independent claims 1 and 2 of the invention, however, set forth a formula $In_xGa_yAl_zAs$ where the amount of indium x can vary between 0 and 1.

This limitation has been re-incorporated into claims 1 and 2 to conform with the Examiner's observation of allowability made during the interview of January 15, 2003.

Further, Udagawa is silent regarding reducing the dislocation density in the epitaxial crystal layer.

As a result, the combination of Mishima and Udagawa would fail to motivate a person having ordinary skill in the art to produce a claimed embodiment of the invention. A *prima facie* case of obviousness has thus not been made over Mishima and Udagawa. Adding the teachings of Kisuki or Inoue fails to address the deficiencies of the combination of Mishima and Udagawa in suggesting the invention.

These rejections are accordingly overcome and withdrawal thereof is respectfully requested.

Information Disclosure Statement

The applicants thank the Examiner for considering the Information Disclosure Statement filed March 25, 2002, and for making the initialed PTO-1449 form of record in the application in the Office Action mailed July 18, 2002.

Foreign Priority

The Examiner has acknowledged foreign priority in the Office Action mailed July 18, 2002.

Th Drawings

The Examiner is respectfully requested to indicate whether the drawing figures are acceptable in the next official action.

Conclusion

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a three (3) month extension of time for filing a reply in connection with the present application, and the required fee of $950.00 is attached hereto. A Notice of Appeal is being filed concurrently in order to keep the application pending.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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2185-0578P

Attachment(s)

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